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Editorial: Occurrence, migration and degradation of emerging organic pollutants in the estuarine environment

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Editorial on the Research Topic

Occurrence, migration and degradation of emerging organic pollutants in the estuarine environment

Emerging pollutants (EPs) denote contaminants resulting from human activities that are present but not subject to regulatory measures, posing risks to life and the ecological environment. Currently, the global environmental challenge lies in the significant environmental pollution caused by EPs. The estuarine environment serves as a crucial bridge connecting land rivers and marine water bodies and as well as a significant pathway for terrigenous pollutants to enter the sea. Upon entering the estuary environment, EPs from terrigenous sources encounter drastic changes in hydrochemical conditions such as pH, salinity, dissolved organic matter, and redox potential. As a result, they undergo diverse chemical processes including coagulation, precipitation, adsorption, and desorption. These processes significantly influence the migration and transformation of EPs within the estuary, as well as their transport flux towards the sea and associated ecological risks. Hence, there exists an urgent need to investigate the multi-media distribution characteristics, as well as the rules governing the migration and transformation processes of EPs within the estuarine environment.

This Research Topic in *Frontiers in Marine Science* comprises articles that delve into the occurrence, distribution, and environmental behavior of EPs within estuarine environments. The primary goal is to examine the occurrence and fate of EPs in the estuary, intending to offer vital support for the protection of estuarine and marine environments.

Luo et al. examined the historical trends of organophosphate esters (OPEs) in sediment cores extracted from the Liao River estuary. They observed that the concentration of OPEs in sediment varied in a wavy pattern with deposition time, correlating with the usage and

emission characteristics of OPEs in the region, as well as the physicochemical properties of the compounds. Notably, the concentration of OPEs in the sediments exhibited a continuous rise after the 1980s, aligning with the sustained growth in the production and utilization of OPEs. [Lu et al.](#) examined the origins of organic matter in a highly human-impacted bay located in the northern Beibu Gulf from the standpoint of stable isotopes and optical properties. Their findings emphasize that, in the upper bay, particulate organic carbon predominantly originated from terrestrial sources. However, in the lower bay, there was an increased contribution of marine-derived organic matter. They highlight that the primary dynamic process governing organic matter in this area is biological production, driven by the excessive availability of nutrients. Both studies indicate that human activities play a significant role in driving environmental changes within estuaries and coastal regions.

[Liu S. et al.](#) explored the indirect photodegradation of ofloxacin (OFX) within simulated seawater. Their findings revealed that dissolved organic matter (DOM) has a considerable enhancing effect on the indirect photodegradation of OFX. The main reactive intermediates (RIs) responsible for promoting the indirect photodegradation of OFX were identified as $^1\text{O}_2$ and $^3\text{DOM}^*$. Terrestrial DOM typically generates a greater quantity of RIs that facilitate the indirect photodegradation of OFX. Factors such as salinity and HCO_3^- contribute to the promotion of OFX's indirect photodegradation, while alkaline conditions favor this process. Conversely, NO_3^- does not exert any influence on the indirect photodegradation of OFX. [Liu M. et al.](#) investigated the sorption behavior and mechanism of thallium (Tl) by microplastics in both freshwater and seawater. Their findings emphasize that polystyrene (PS) primarily adsorbs Tl through surface complexation, whereas polyethylene and polypropylene exhibit mainly physical adsorption. PS demonstrates the highest adsorption capacity, although it remains considerably lower than that of natural minerals. Based on these results, microplastics may not be the primary factors influencing the environmental behavior of Tl. These two studies offer valuable insights into the fate, removal, and transformation of EPs.

[Fan et al.](#) researched the toxic effects of EPs, employing the species sensitivity distribution and assessment factor approaches. They derived predicted no-effect concentrations for thirty-five pharmaceuticals and personal care products, considering acute and chronic toxicity data. The study underscores that endocrine-disrupting chemicals and antipsychotics pose a more significant threat to freshwater environments and organisms. Notably, chloramphenicol and fluoxetine were identified as potential sources of significant ecological risks. This study offers crucial scientific insights into the environmental management and risk control of EPs.

In summary, this Research Topic encompasses articles that delve into the occurrence, migration, degradation, and toxicity of EPs within estuarine and coastal areas. These studies have shed light on the occurrence, distribution, and potential sources of specific EPs in distinct regions. Additionally, they have derived predicted no-effect concentrations for some EPs, offering crucial support for the environmental risk assessment of these pollutants. Moreover, authors have investigated the sorption behavior and degradation processes of select EPs, providing novel insights into their migration and removal mechanisms. Overall, these findings provide valuable knowledge regarding the occurrence and fate of EPs in the estuarine environment, contributing to the protection of estuaries and marine ecosystems. However, as there is a very large variety of EPs, the physicochemical properties of different EPs may vary greatly, making their behavior in the estuarine environment potentially very different as well. It is impossible to study all types of EPs in a short period. Therefore, in the future, studies on the toxic effects of emerging pollutants should be carried out first, followed by sequential studies on their occurrence, migration, and degradation in the estuarine environment based on their toxicity and physicochemical property.

Author contributions

QL, MA, MAA, GJ, and MZ worked collaboratively in designing the Research Topic, inviting authors, editing manuscripts, and editorial monitoring. It is also commendable that all authors contributed to the article and approved the submitted version. Collaborative efforts among researchers can lead to high-quality research outcomes and publications.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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